

OBITER SCRIPTA
THROAT, NOSE, AND EAR

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THROAT, NOSE, AND EAR.

BY

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PREFACE.

IN this brochure I venture to place before my fellow students some notes on the treatment of abnormal conditions in the Throat, Nose, and Ear, frequently met with in practice. Special attention is given to some points bearing on the application to infections in these regions of the methods devised by Sir Almroth Wright on the one hand, and by Professor Leduc, of Nantes, on the other, for the combating of bacterial diseases.

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OBITER SCRIPTA.

CHAPTER I.

MISCELLANEOUS NOTES ON COMMON CONDITIONS IN THE THROAT NOSE, AND EAR.

WHEN an anæsthetic for the removal of tonsils and adenoids is administered, if any difficulty occurs with the breathing, the smooth orderliness of an operation is disturbed and the difficulty of performing it increased. Easy respiration is as important for safety as it is desirable for efficient and accurate work by the operator. To ensure an unobstructed airway the head should be kept in the same plane as the trunk, and the blood and secretion should flow into the mouth or nasopharynx and not into the lower part of the pharynx and larynx. Both these conditions can be obtained and maintained by letting the patient lie flat on a table which slopes as a whole so that the head is lower than the feet. The foot of the table is raised by putting two blocks about 6 in. to 8 in. high on the ground and resting the feet of the table in shallow depressions in them.

I have adopted this position for some years, and have every reason to be satisfied with it.

When one thinks of the position and structure of the tonsils ; that every time a person swallows, the tonsils are squeezed, and that this is followed by a relaxation and presumably a sponge-like act of suction of blood and lymph, one is forced to the conclusion that something is squeezed out from them into the digestive tract. This is one reason why when in doubt as to the advisability of removing a child's tonsils, a postponement of the operation can be recommended.

Efforts at the prevention of diseased tonsils and adenoids could be begun by attention to the food of children and the frequency of their meals. It has been shown how important a factor this is for the preservation of their teeth, and it is presumably the same with regard to the prevention of diseased tonsils and adenoids.

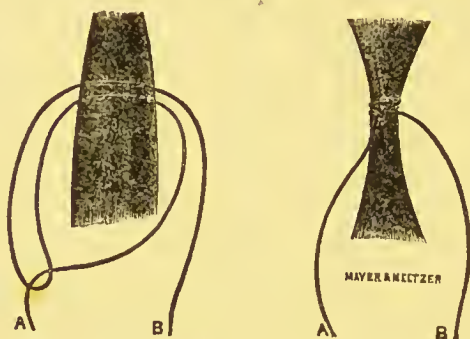
For the removal of small septic fibrous and adherent tonsils in adults, I find a large punch forceps efficient. It is introduced into the mouth obliquely, keeping the shaft in the opposite angle of the mouth to the tonsil requiring removal ; the jaws of the forceps are then pushed well in between the pillars of the fauces and opened so widely in a vertical direction that the upper blade is above the upper pole and the lower below the lower pole. One bite is sufficient to remove the greater part, if not the whole, of such tonsils.

In removing adenoids, if the curette is

passed behind the soft palate and drawn forward till it is felt to touch the posterior edge of the septum, and then made to travel up this by depressing the handle of the curette till the roof is reached, the cutting edge will be in front of all the adenoids, and one sweep should bring a mass out on the edge of the curette. If care is not taken to keep in contact with the posterior edge of the septum, and so in front of the adenoids, the mass is indented by the curette and only the posterior part removed, while the anterior part is left.

I have met with troublesome hæmorrhage after most methods that I have tried for removing tonsils, and it is a great help to know a method of readily applying a stitch to control it. The throat is an awkward place in which to tie a knot, but the difficulty can be surmounted by the following device. A curved needle on a handle is threaded and passed through one pillar of the fauces, and then the other, and the silk or catgut is caught in a long pair of dissecting-forceps close to the eye and drawn as a loop out of the mouth, while at the same time the needle is withdrawn. We have then two free ends and one loop outside the mouth. *One* free end is passed through the loop, and both free ends are drawn on. This brings the loop into the mouth, and against the pillars, but it cannot pull through on account of the thread which has been passed through it. The tighter one pulls in

reason the firmer is the suture, and it does not slip as you apply an extra half knot. This method has stood me in good stead on several occasions, and is suitable to employ for tying a stitch in other places difficult of access. I use it regularly in stitching the flap in the operation of submucous resection of the deflected septum in the nose.

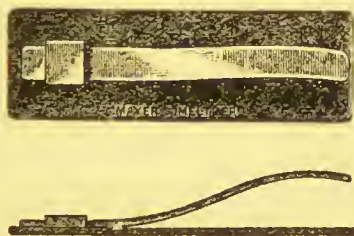


One of the conditions that we are most frequently called upon to treat is defective nasal respiration. A distinction should be made between nasal obstruction and nasal insufficiency. The former is amenable to treatment in most cases, but the latter is usually best left alone. In deciding on the site of the obstruction, it is a good plan first to have a look at the nose *without* a speculum; and in deciding where to make the incision in the soft tissues in a submucous resection of the septum, it is wise, if possible, to *decide* where to make it *without* introducing a speculum. A mistake

in diagnosis or treatment and an unsatisfactory result may be thereby avoided.

This operation, to my mind, is completed when there is free respiration through the affected side and no projection on the septum in, or almost in, contact with the inferior turbinal. It is not completed if on respiration the soft tissues of the septum "flap." This means that there is still obstruction on one side. Also, if the flap that has been raised from one side does not lie in nice apposition with the tissues of the opposite side when replaced, it means that the *extremity* of the deflection has not been sufficiently removed.

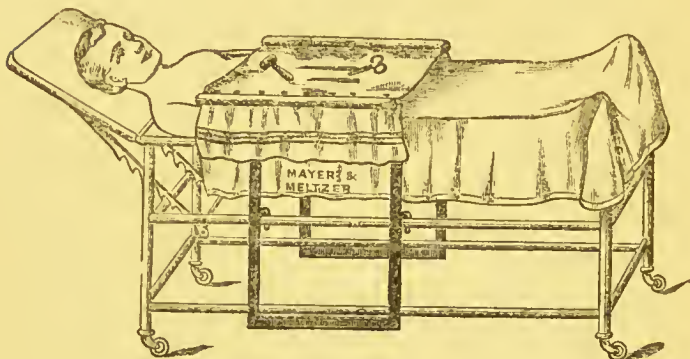
There is a small instrument called a flap clip which can be readily made from an inch and a half or so of weak watch- or clock-spring and a piece of tin of the same length and half



an inch wide. Its use is to hold the flap that has been raised and keep it from injury, and to save time by not having frequently to lift it out of the way. It is held by the watch-spring pressing against its inner side while the

tin is against the outer side of the ala of the nose.

A "rest" to hold in a convenient place instruments that are frequently used in this operation is illustrated here, and is named



"Dr. Squire's rest." The uprights are adjustable as to height, and can be placed nearer the head or foot of the table as required. The "rest" portion consists of a sterilized towel pinned to the uprights and lying on the patient.



Needle for electrolysis, insulated with sealing wax for part of its length.

Vasomotor rhinitis, and other conditions of active or passive congestion in the nose, can be much improved by electrolysis of the part where swelling is marked. This is usually the

inferior turbinal or the septum opposite the middle turbinal. Darning needles which have been electroplated with zinc form suitable instruments for electrolysis. A portion of the needle is insulated by heating it a little and rubbing it against a stick of sealing-wax. The needle is pushed into the tissue of the inferior turbinal for example, parallel and close to the bone, for an inch and a half, till an eighth of an inch of the sealing-wax is buried in the tissue. Attention to this little point prevents the development of a small ulcer where the needle enters the tissue. Electrolysis of an inferior turbinal may have to be done once or twice, and possibly of the posterior part as well as the anterior. The shrinkage caused by it in a turbinal which becomes congested when a patient lies down is most marked. No after-treatment is necessary beyond wearing a bit of cotton-wool in the nose for an hour if bleeding follows withdrawal of the needle. The needle is readily introduced by fixing it in a handle, and this is connected to the positive pole of a continuous-current battery, and the strength of current used is 10 to 15 ma. The current should be gradually increased from zero, and after fifteen minutes gradually reduced to zero. The commutator is then reversed and the current allowed to flow in the opposite direction for a short time till the needle is somewhat loosened. It is surprising how tightly the needle is sometimes fixed in

the tissues, and if it were forcibly torn out, considerable bleeding and pain would be caused. When the needle is made the negative pole, caustic soda is formed at its surface; this acts as a solvent and allows easier extraction of the needle.

This method of treatment, which I learned from Professor Leduc, is far superior to the galvano-cautery in every way. There is no septic slough, no painful swelling, and no inflammation to trouble the patient afterwards; and there is no destruction of mucous membrane and epithelium. It is a gratifying method of treatment. Patients requiring it are not seriously ill, but they are considerably inconvenienced by their condition, and compared with other operative procedures for their relief the risk and pain are minimal.

I have seen patients suffering from what is often called by the public "hay fever" derive great benefit from electrolysis of the inferior turbinal. Although it cannot be regarded as a cure for true hay fever, still the vicious circle of irritation, congestion, obstruction, and increased irritation is broken.

There are two conditions which occur more or less frequently in practice. One is a foreign body in a child's ear, and the other hysterical aphonia. To extract the foreign body, I find nothing so convenient as the small rough broach which dentists use to extract the nerve from a tooth. It can be bent at right angles

three-sixteenths of an inch from the end, and insinuated past most foreign bodies on account of its thinness. The little teeth on the metal just catch sufficiently on the foreign body to prevent the instrument slipping when pulling the body outwards along the meatus.

Hysterical aphonia is sometimes treated by an electric shock, but in the case of a sufferer who is anxious to speak, the following plan has often helped me. Ask the patient to hum a low note, and help her by holding a C, G or A tuning-fork close to the ear. After a few attempts the vocal cords come into action, and once the patient can hum, confidence to speak follows.

Information as to the seat of the trouble, the causes of chronicity, and hints for treatment, can be gained by microscopic examination of the discharge in cases of aural inflammation. Thus it is not always easy to say whether a patient who complains of pain in the ear, and is evidently suffering from inflammation in the meatus, has not concomitant trouble in the middle-ear. The meatus may be much swollen and blocked up by accumulation of secretion. When a slide is made of this, if the inflammation is limited to the meatus, the feature of the slide will be the large number of squames and cocci present. On the other hand, secretion from the middle-ear is characterized by the absence of squames and the presence of leuco-

cytes. This fact has often helped me to decide the line of treatment to be followed.

Furunculosis of the meatus can be well treated by combining the injection of a stock staphylococcus vaccine with the daily painting of the meatus with Tr. Iodi recommended by Dr. Woakes.

Dr. Wingrave has given much information about the nature of the leucocytes and the variety of bacteria present in discharge coming from the middle ear; and from the point of view of diagnosing the nature and seat of the disease, much is gained by combining a consideration of the quantity, colour, and appearance of the discharge with a microscopic examination of it. In chronic middle-ear suppuration the discharge is or is not foetid. If foetor does not disappear with cleansing and the use of alcohol drops, and if microscopic examination still shows large numbers of leucocytes, many of which are feebly stained and of indistinct outline, while many bacteria of different sorts are present, one may safely conclude that there is a well of matter which is overflowing into the tympanum. In many cases this means mastoid disease. The discharge, which is characterized by foetor, enormous numbers of bacteria, and very few leucocytes, may yield to alcohol drops. Cases of chronic middle-ear suppuration where there is no foetor, where the leucocytes are well stained, and there is only one variety of infecting organism, are usually amenable to treat-

ment without operation. Here, as well as in acute cases of middle-ear disease, great benefit may follow the use of an autogenous vaccine. Where the infection is very mixed, the same results are not to be expected, and here other treatment, such as zinc ionization or operation, is necessary.

The information to be gained by microscopical examination in cases of nasal discharge is also considerable. Some cases which look like hay fever with watery secretion may be due to bacterial infection. Here I have seen an autogenous vaccine cure the patient completely.

Cases of chronic nasal catarrh with one infecting organism are easily treated and greatly benefited by vaccines; whereas many cases of nasal discharge (not due to empyema of the antrum or frontal sinus) with great numbers of micro-organisms of more than one kind present in the secretion give much trouble. I believe there are two reasons for this: one, infection of the ethmoidal cells; and the other, the presence of bacteria in the tissues.

A rhinitis and sinus infection may co-exist. Here x-ray examination and interpretation of the plates by an expert may be of great help. A chronic discharge with a very mixed and large bacterial flora indicates sinus infection. If a small piece of the inferior turbinal in some troublesome cases of nasal discharge be punched off, hardened, and sections of it examined,

micro-organisms can be seen in the tissues at some distance beneath the epithelium. When one organism has been banished from the secretion another may take its place, and so frequent bacteriological examination of nasal discharge is necessary when treating cases by vaccines, to make sure that the right vaccine is being employed.

On account of the ease of diagnosis and readiness in controlling the result, nasal catarrh is an excellent subject to convince oneself of the benefit following the injection of autogenous vaccines.

It has often been pointed out that, in the treatment of nasal catarrh due to bacterial infection, apart from the correction of marked anatomical deformities, one should search for and eliminate pyorrhœa, decayed teeth, septic tonsils, and adenoids ; but one sometimes overlooks and forgets this, and a case takes longer to treat than it otherwise would do.

CHAPTER II.

ZINC IONIZATION.

THE treatment of septic surfaces by the introduction of the zinc ion into the actual tissues involved, by means of the continuous electric current, and which we owe to Professor Leduc, of Nantes, is simple and effective.

The contrast between a slide made from a septic ear before ionization and on the day following is remarkable. The first may contain numbers of bacteria ; in the second it may be difficult to find even one.

Ionization with zinc is, I believe, the ideal treatment for many cases of chronic middle-ear suppuration and for uncomplicated simple empyema of the frontal maxillary or sphenoidal sinus. The technique to be followed in the application has for its aim the treatment of the *whole* of the infected surface. Care to ensure this is essential to success.

The source of the current may be a battery of 30 to 40 large-sized Leclanché cells coupled in series. They yield a steady current.

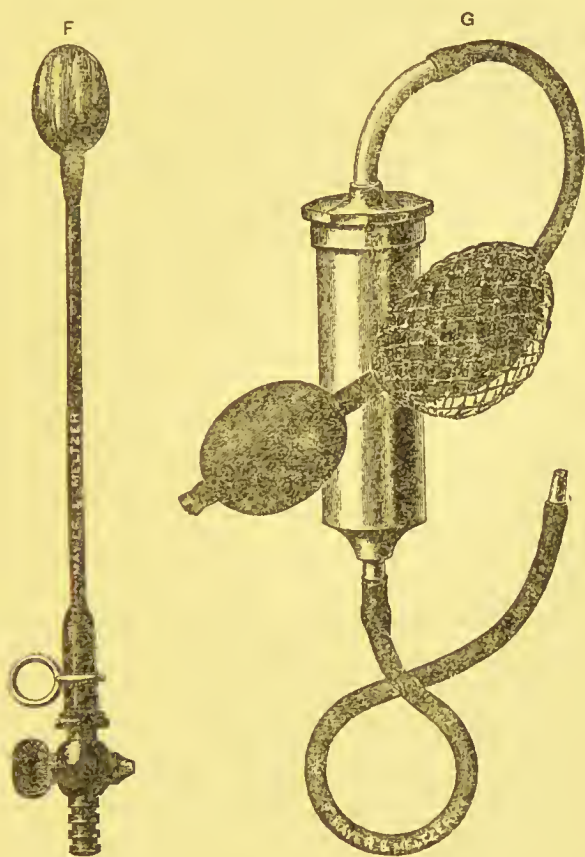
The current is measured by a milliampère-meter, and can be regulated by a rheostat. It is conveyed to the patient by copper wire covered by rubber (not silk), and soldered to

the electrodes ; one electrode attached to the negative pole may be conveniently applied to the forearm, and consists of a sheet of tin separated from the skin by a folded towel or many layers of lint wet with salt solution. It can be held in position by a pair of oval bicycle trouser clips covered with rubber tubing.

The accompanying diagrams (pp. 25, 27) illustrate the electrodes suitable to use for middle-ear suppuration, for the maxillary antrum, and the frontal and sphenoidal sinuses. Attention may be drawn to the small balloon used to block up the posterior nares when ionizing the nose or sinuses. It consists of a vulcanite Eustachian catheter straightened, and a rubber finger-stall, rubber tubing, and a stop-cock. It is easier to keep the sinuses full if the posterior nares are blocked up.

The cannulas are made of platinized silver, and can be obtained from Messrs. Mayer and Meltzer. When used they should be insulated on the outside to prevent short circuits of the current on to the tissues directly instead of passing through the sulphate of zinc solution which fills the cavity to be ionized, and from which the zinc ion is derived. The insulation can be effected by thin rubber tubing, or by dipping the cannula (having first blocked up the opening at the end by a tiny plug of grease) in a bottle of celloidin dissolved in alcohol and ether (1 part celloidin and 4 parts each of absolute alcohol and ether). When this is dry it forms a firm

insulating layer. The current then flows from the inside of the cannula through the solution



IONIZATION APPARATUS.

- F Balloon for Posterior Nares.
- G Reservoir for Solution.

filling the cavity, to the tissues, and takes the zinc in. The cannulas are attached to the positive pole of the battery.

The strength of the zinc solution used should be weak. A 0.25 per cent is a suitable strength for the nose. If a strong solution is used, the fluid running over the upper part of the nasal cavity produces much pain and smarting, with subsequent headache.

Professor Leduc has pointed out to me that it is well to make the solution of zinc sulphate isotonic with the blood by adding to the electrolyte (zinc sulphate) a mixture of non-electrolytes, such as glucose and glycerine. Injury to the epithelium through a difference in the osmotic pressure between the cell contents and the ionizing solution is thereby avoided.

The following formula is suggested :

Grape Sugar	..	..	28.5	grams
Glycerine	..	..	14.4	„
Zinc Sulphate	..	..	2.5	„
Water	..	..	1000	c.c.

As a receptacle to hold the sulphate of zinc, the barrel of a metal syringe is useful, and is attached to the end of the cannula by a piece of rubber tubing. The top screws on, and the hole where the piston-rod formerly was, can be occupied at will by a piece of brass tubing attached to a bellows. If the liquid does not flow readily, it can be assisted by increasing the air-pressure in the upper part of the barrel. Once the sinus is full, a slight trickling of fluid is all that is necessary to replace any leakage.

The current is increased and diminished gradually, especially in the case of the ear, and

should not be so strong as to cause pain or giddiness. A strength of 3 ma. for the ear, allowed to act for about six minutes, is sufficient. For the nasal sinuses 10 to 20 ma. for ten minutes is applied.

Cases suitable for treatment by ionization are chronic middle-ear suppuration, in which the perforation is large enough to allow fluid to run into the middle ear, and in which there is no extensive bone disease or mastoid trouble. In the case of the nasal sinuses; empyema of the antrum, when there is not concomitant disease of the ethmoid, or polypi, or diseased bone in the walls of the cavity; empyema of the frontal or sphenoidal sinus without co-existing suppuration in the ethmoid cells.

If there is a raw surface, the current will by preference enter there and spare the rest of the surface. The presence of granulations and raw surfaces produced by operation diminish the likelihood of success. Speaking generally, zinc ionization is specially indicated where we have an infected cavity that is badly drained. To drain it properly would entail a surgical operation, and ionization with zinc may entirely obviate the necessity for this. Treatment by ionization and vaccines are not contradictory but supplementary. We know that the presence of a well containing putrefying fluid renders treatment by vaccines useless. It is in these cases that ionization is of so much help.

Some cases of suppuration with perforation in Shrapnell's membrane yield readily to this treatment. Suppuration here is difficult to treat on account of the difficulty of cleansing the pockets, and ionization is less irritating and far more efficacious than attic syringing.

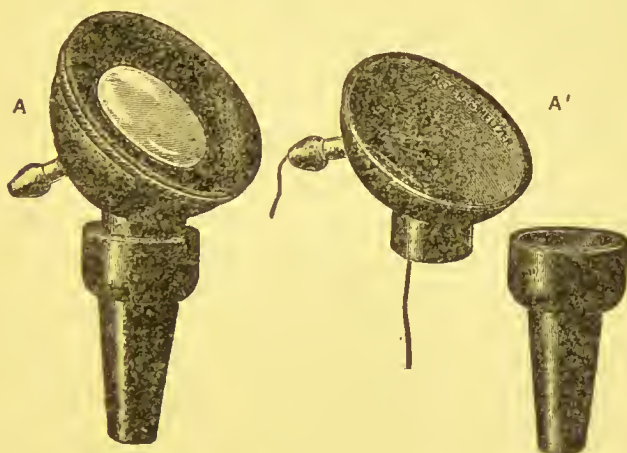
Ionization is also beneficial in cases where a small ulcer in the external auditory meatus causes intense itching.

One application may be quite sufficient to cure completely a case of chronic ear or maxillary-antrum suppuration. If great improvement does not follow the first application, the probability is that the diagnosis was insufficient, or that the method of application was faulty. X-ray photographs and the interpretation of them by an expert will be of help in diagnosing ethmoidal disease. More care in application may remedy the second fault. I shall never forget the first patient with chronic maxillary empyema that I treated with this method, and because it illustrates an important point I relate it. He had both antra involved; the pus contained staphylococci and streptococci from which I prepared vaccines. The right antrum was ionized, and was quite well next day, and has remained so. The left antrum was ionized on the following day without improvement, and so on several subsequent occasions. Thinking over what could be the cause of this, it occurred to me that possibly there might be an anatomical recess into which

the fluid did not reach, so he was ionized sitting up and then lying down. The patient was well next day, and has since remained free from any antral trouble on either side.

The details of application are as follows :—

Middle-Ear.—All discharge is removed by syringing with warm water. The ear is then syringed with warm weak sulphate of zinc solution (not stronger than 1 per cent), and the



IONIZATION APPARATUS.
Electrode for the Ear.

patient lies with the affected ear uppermost. The ear-piece of a Siegel's pneumatic speculum is introduced into the meatus, and half filled with the sulphate of zinc solution. Suction is then applied by attaching the outer portion (*Fig. A*) and a bulb. This is in order to remove any bubble of air which may be by chance entangled in the deeper parts. The outer portion

of the speculum is then removed and replaced by the electrode (*Fig. A'*) connected with the positive pole of the battery. A small wick of cotton-wool is insinuated alongside the wire into the deeper parts of the meatus, so that if by chance the fluid in the speculum is spilled, the current is not broken.

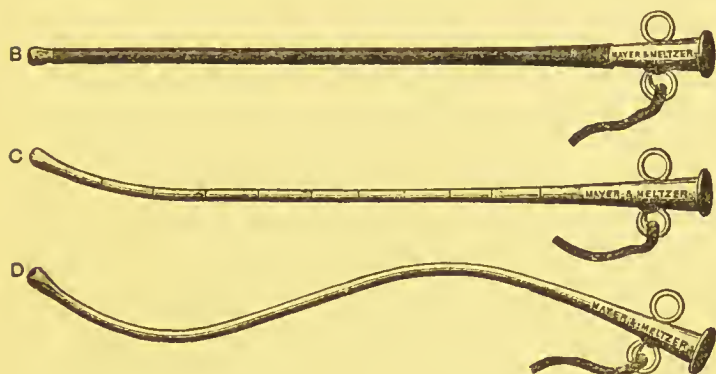
The current is gradually increased to 1 or 3 ma., and allowed to act for five to ten minutes. If the patient should become giddy it is wiser to use a weak current for a longer period than a strong current for a short period.

Nasal Sinuses.—In the case of nasal sinuses the discharge is first washed away with warm water, and then the cavity is syringed with weak ZnSO_4 solution (0.25 per cent) and filled with it, and every effort made to keep it full.

For the maxillary antrum, cocaine is rubbed into the inferior meatus, and the antrum punctured with an ordinary trocar and cannula, a finger's breadth behind the anterior extremity of the inferior turbinal. When the syringing is completed, and the fluid coming away is quite clear, the ordinary cannula is removed, and the special one immediately inserted. Up to this point the patient lay with the diseased side uppermost; now he turns over on the other side, and the posterior naris is blocked by means of a balloon. The receptacle containing the sulphate of zinc solution is attached to the cannula, and fluid allowed to run into the cavity, which is then kept full by a constant

trickle. The current is increased, so long as it is not painful, to about 20 ma., and allowed to act for ten minutes. Ionization for a long time, or with a strong current, is to be deprecated.

In the case of the frontal sinuses the procedure is much the same, except that the patient lies on his back, and when the special cannula is



ELECTRODES.

- B For the Antrum of Highmore.
- C For the Frontal Sinus.
- D For the Sphenoidal Sinus.

introduced the foot of the table is well raised, and he is asked to let his head hang down backwards over the edge of the table.

For the sphenoidal sinus the patient lies on his back with the table horizontal.

Where the nose, apart from the sinuses, requires ionization, all that is necessary is to insert the balloon into the post-nasal space and fill the nose with solution, and into this solution dip a metal wire connected with the battery.

I use the same apparatus for this as for the ear, and insinuate a thin bit of gauze past the wire into the solution. To ionize the post-nasal space a sponge can be fastened on an adenoid curette; on the anterior face of the sponge a small piece of waterproof tissue is sewn, and the handle of the instrument inside the mouth is enveloped with this also.

If great improvement, but not complete cure, follows ionization, the treatment can be repeated in ten days. If no improvement follows, diagnosis and method of application should be revised. A striking fact about ionization is that one application may cure. If the whole of the infected surface has been ionized, improvement, one might say, *must* follow.

At the risk of repetition, it may be well to state distinctly that where the whole of the affected area cannot be ionized, success is not to be expected. This is why co-existent ethmoidal disease is prejudicial to the cure of empyema of the maxillary antrum by ionization of the latter.

Vaccines are indicated when the tissues are infected by bacteria, and when this condition is complicated by the accumulation of septic secretion in a cavity, it is advisable to ionize the cavity with zinc.

CHAPTER III.

THE TREATMENT OF OZÆNA :

WITH SOME NOTES ON
FRIEDLÄNDER'S PNEUMOBACTERIUM.

IN studying ozæna it may be noticed that the crusts are present in both the lower and upper parts of the nose. When they are removed, if a little mucus be taken from either of these regions, and slides made, stained, and examined, it will be seen that the mucus swarms with bacteria of many different kinds, which, in company with many well-stained leucocytes, are entangled in a meshwork of fibrin and mucin. The disease is characterized by chronicity and obstinacy to treatment. It may be stated that the symptoms of ozæna are due to the bacterial infection, and if treatment is to be successful, the bacterial infection must disappear. When we consider the methods available to ensure this, vaccine treatment naturally occurs to our minds. The organisms present in largest number in most cases are Friedländer's pneumobacterium and pseudodiphtheroid bacteria ; and there are also Gram-negative bacteria resembling the *B. influenza*, pneumococci, streptococci, staphylococci, some Gram-negative

cocci, as well as some other Gram-negative and Gram-positive bacteria. Truly a mixed infection of a formidable nature.

To treat or to study a case of this disease, a tractable persevering patient is a necessity. I have been fortunate in having had some, and various facts stand out as important. The conclusions drawn from them appear to me necessary to observe.

First.—The Friedländer infection, which is present in all or nearly all cases, must be overcome. To do this an intravenous injection of a vaccine, preferably a living sensitized one, is efficacious.

Secondly.—The fact that the ethmoidal cells are involved. The cause of the chronicity of the disease and its obstinacy to treatment consists, I believe, in the fact that the cells are occupied by thick infected mucus, and are never drained. There is a never-ending re-infection.

When these facts are recognized, and various methods at our disposal are employed, the condition in the nose improves beyond expectation. The principal measures available to overcome the bacterial infection are vaccine treatment and ionization of the ethmoidal cells. In addition, the interior of the nose has to be kept clean and free from any accumulated discharge, and this can be done by the patient rubbing out his nose once or twice a day with a piece of cotton-wool wrapped round the end of a wire dipped in a solution, e.g., of menthol in paroleine.

It appears to me that Friedländer vaccine when given subcutaneously is almost useless. During the past few years I have on many occasions given doses subcutaneously with practically no benefit ; but as soon as I began to give them intravenously, improvement was immediate. Instead of being a most refractory infection to treat, it now responds at once. Three doses of two millions of a sensitized living vaccine, injected at intervals of three days or somewhat longer, produce a marked improvement. After a time it may, in some cases, be impossible to cultivate the bacterium from the nasal secretion.

There are several interesting points to be noticed in connection with the Friedländer bacterium. Most strains are quite resistant to phagocytosis, adopting the ordinary method of performing an opsonic test and using human or uninoculated rabbit's serum. If a rabbit receives two or three or more intravenous injections of an emulsion of living Friedländer bacteria at intervals of a week or ten days, the serum acquires the power of agglutinating, opsonizing, and dissolving the bacteria. Ordinary rabbit serum is usually quite inactive as regards the Friedländer, but the serum derived from the inoculated rabbit is extremely active, so that the leucocytes in a slide prepared in the usual way for doing an opsonic index may be packed with bacteria, and there may be large masses of agglutinated bacteria in and outside

the cells. Macroscopically, B. Friedländer is not agglutinated by the serum of an uninoculated rabbit, but using the serum of the treated rabbit, agglutination is marked. It has not been possible to induce instant agglutination with dilutions of serum, but using 1, 2, 3, or 4 volumes of serum to one of emulsion, the bacteria rush into clumps, whereas even six volumes of ordinary serum have no visible effect even after being in contact with the bacteria for hours. A clump may be so firm that if it is removed from the serum and placed in a mechanical shaker with salt solution, a homogeneous emulsion cannot be obtained. If placed in distilled water it is instantly dissipated.

The serum has also acquired strong bacteriolytic properties, as can be readily demonstrated with the dark ground-method, so that if a vaccine is to be sensitized with a very active immune serum, the latter must be heated to 56° for half an hour to destroy complement, previous to adding the emulsion, in order to avoid dissolution of the bacteria.

To indicate a slight degree of opsonic power, a modification of the ordinary method of carrying out an opsonic test is desirable. Six volumes of serum plus one volume of a living emulsion of a twenty-four-hour growth are incubated for eighteen hours. The mixture is then centrifugalized, the serum pipetted off, and the bacteria are emulsified with a little salt solution. One volume of this plus one volume

of unused or fresh serum plus one volume of corpuscles, are mixed and incubated for an hour, and slides are then spread, stained, and examined. Ordinary human serum is usually inactive even with this method.

In seeking for an explanation why an intravenous is superior to a subcutaneous injection in producing an immune serum, it may be noted that if a rabbit receives a large dose of bacteria intravenously, and the blood be examined at intervals until no bacteria are detected, and then the rabbit be chloroformed and killed, and smears made from the liver, kidneys, muscles, lung, and bone-marrow, it will be found that the bacteria are in the liver cells and also in the kidney, but especially in the liver, and practically nowhere else. It may be that for the production of some immune bodies an internal organ, such as the liver, is an essential factor, and that consequently, if the vaccine is given intravenously, the production of immunity is more rapid and greater.

Of course, in the case of animals injected with B. Friedländer, the animals were not infected with the organism prior to injection, and it would not be right to conclude straight away that the same method should be used for infected human patients. However, I have, as stated, given hypodermic injections of B. Friedländer vaccine to patients without benefit many times, but have, on the other hand, found a marked beneficial effect by the intra-

venous method, using either a killed emulsion or a non-sterilized sensitized one.

In the above cases subjected to immunization it is the "subject" which is altered. However, a change may also be produced in the bacteria, and a new strain formed by the action of immune serum on the bacteria; and this fact may possibly be of use in altering a virulent organism to one less so, and perhaps more suitable with which to commence a course of vaccine treatment. The B. Friedländer is, as I have said, usually quite insensitive to the opsonizing or agglutinating action of ordinary human serum. If, however, one volume of a Friedländer emulsion be mixed with six volumes of inactivated immune serum, and allowed to remain in contact from three to five hours, and if the clump of bacteria be then removed from the serum, and washed two or three times in salt solution, and then planted, a good growth on the culture tube will take place by the following day. If this process is then repeated for a few times it will be found that a remarkable change has taken place in the Friedländer, and this change is preserved for several sub-cultures without treatment with immune serum. The bacteria are now slightly agglutinated and readily opsonized by ordinary human serum. This is shown by a series of opsonic tests made with emulsions from these growths with salt solution. The total period of incubation was only a quarter of an hour.

				No. of Bacteria in 50 cells.
No. 0 = <i>Original Strain of Friedländer</i>	..	..	..	1
No. 1 pianticated	..	..	..	59
„ 2 „	..	..	..	2
„ 3 „	..	..	..	57
„ 4 „	..	..	..	51
„ 5 „	..	..	..	4
„ 6 „	..	..	..	60
„ 7 „	..	..	..	132
„ 8 „ agglutination in slide				127
„ 9 „ „	„	„	„	149
„ 10 „ „	„	„	„	144

In the first few experiments the serum used for sensitizing was unheated, but in the later experiments it was inactivated.

To designate this particular method of altering the quality or property of bacteria, the word “piantic” is suggested. It is derived from the Greek *πιαντικός*, fat, the idea being that of fattening an animal previous to slaughter.

Returning to the treatment of ozæna, it is found that when the Friedländer infection has been diminished, there is also a considerable diminution in the secretion in the nose, and it is well then to give subcutaneous injections of streptococcus or B. influenza vaccines if these organisms are present, or any other vaccine which may be indicated.

I have no experience yet of the treatment of ozæna with a vaccine made from the ozæna bacillus discovered by Perez.

Vaccine treatment by itself, I believe, is

seldom able to render the secretion quite sterile, or keep it so. The infected ethmoidal cells require treatment by other means as well. Serum rich in antibody can only be expected to act on those bacteria with which it can come in contact. Bacteria lying in thick mucus in the interior of an ethmoidal cell are presumably removed from its sphere of action.

Zinc ionization has been recommended for the treatment of ozæna, but I did not obtain any satisfactory result until I directed my efforts to ionize the interior of the ethmoidal cells. If a suitably bent metal rod be introduced into the nose, and made to penetrate the outer wall, in front of and at the level of the attachment of the middle turbinal, it can be made to traverse the labyrinth, even entering the sphenoidal sinus. When the rod is removed its place can be taken by an electrode made from a long vulcanite Eustachian catheter, suitably bent and containing a wire, and with numerous perforations in its wall for the last $1\frac{1}{2}$ inches. This cannula is connected with a receptacle containing weak sulphate of zinc, and the cells are filled and ionized. The introduction of the balloon to block the post-nasal space should not be omitted.

With vaccine treatment and ionization at our disposal I do not dread seeing a case of ozæna as I used to do. The treatment outlined above has given me far better results than any other I have tried.

To shortly summarize the treatment :

1. Removal of crusts daily for the first two weeks by forceps. Bacteriological examination and preparation of a vaccine or vaccines.

2. Injection of a dose of Friedländer bacterium intravenously, small enough to avoid the production of severe constitutional symptoms, such as headache or vomiting, and large enough to cause slight malaise. Two millions of a living sensitized emulsion is a suitable dose. It need not be much increased.

3. Ionization of the ethmoidal cells.

4. The patient to rub out his nose daily with a bit of cotton wool wrapped round the end of a wire and dipped in a solution of menthol in paroleine.

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